

Remember to SOLVE ELEGANTLY ☺

1. How many grams of  $^{238}\text{U}$  are left after 40.0 years if a sample originally weighed 150. grams and had a half life of  $4.5 \times 10^8$  years? (150. g)

$$X = 150 \text{ g} \left(\frac{1}{2}\right)^{40/4.5 \times 10^8} = 150 \text{ g}$$

2. How many grams of  $^{137}\text{Cs}$  are left after 28 years if a sample originally weighed 75 grams and had a half life of 30 years? (39.3 g)

$$X = 75 \text{ g} \left(\frac{1}{2}\right)^{28/30} = 39.3 \text{ g}$$

3. How many grams of  $^{14}\text{C}$  are left after 150 years if a sample originally weighed 16 grams and had a half life of 5715 years? (15.7 g)

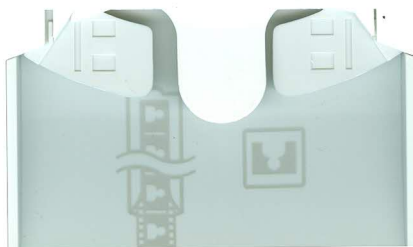
$$X = 16 \left(\frac{1}{2}\right)^{150/5715} = 15.7 \text{ g}$$

4. How many grams of  $^{40}\text{K}$  are left after 1000 years if a sample originally weighed 45 grams and had a half life of  $1.3 \times 10^9$  years? (45.0 g)

$$X = 45 \left(\frac{1}{2}\right)^{1000/1.3 \times 10^9} = 45.0 \text{ g}$$

5. How many grams of  $^{131}\text{I}$  are left after 15 years if a sample originally weighed 25 grams and had a half life of 8.03 days? (0 grams)

$$X = 25 \left(\frac{1}{2}\right)^{(15 \times 365)/8.03} = 0 \text{ g}$$



## HALF-LIFE QUIZ #1

NAME

Key

1. If you start with 10.6 grams of thorium-234 ( $t_{1/2} = 24.10$  days), how much is left after 1 year?

$$X = 10.6 \text{ g} \left( \frac{1}{2} \right)^{365/24.1} = 0.000293 \text{ g}$$

2. The half-life of  $^{14}\text{C}$  is 5370 years, how old is a sample that started as 128 grams and is now only 2 grams?

$$\frac{2 \text{ g}}{128 \text{ g}} = \frac{1}{64} = \left( \frac{1}{2} \right)^n \quad n = 6 \quad TE = 6 \times 5370 = 32220 \text{ yrs}$$

3. Strontium-90 is commonly found in milk and bones and has a half-life of 28.1 years. If you start with  $6.57 \times 10^{23}$  atoms of Sr-90, how much would be left after 3 years?

$$X = 6.57 \times 10^{23} \text{ atoms} \left( \frac{1}{2} \right)^{3/28.1} = 6.10 \times 10^{23} \text{ atoms}$$

4. What is the half life of aluminum-26 if it takes 6539 years for 64 grams to decay to 16 grams?

$$\frac{16}{64} = \frac{1}{4} = \left( \frac{1}{2} \right)^n \quad n = 2 \quad t_{1/2} = \frac{6539}{2} = 3269.5 \text{ years}$$

## HALF-LIFE QUIZ #1

NAME

- If you start with 10.6 grams of thorium-234 ( $t_{1/2} = 24.10$  days), how much is left after 1 year?
- The half-life of  $^{14}\text{C}$  is 5370 years, how old is a sample that started as 128 grams and is now only 2 grams?
- Strontium-90 is commonly found in milk and bones and has a half-life of 28.1 years. If you start with  $6.57 \times 10^{23}$  atoms of Sr-90, how much would be left after 3 years?
- What is the half life of aluminum-26 if it takes 6539 years for 64 grams to decay to 16 grams?

